Game Theory and Applications
Volume 13 (2008)

Preface

Decisions Between Incompletely Informed Agents: A Basic Rating Game 1–16
V. Bieta

Abstract

In the paper the thesis is taken that ratings are strategic games. In a simple non-cooperative bargaining game we substantiate our claim firstly by establishing a sequential equilibrium and secondly by deriving some of its properties. We show how negotiations prevent a conflict and how bargaining power terminates it. Further, our model includes the decision to begin a conflict as well as the decision to continue it. Finally, we get insights from the model for further research.

Cost Sharing in Electricity Transmission Grid 17–30
B. Dong, Y.Wang

Abstract

We propose a dual serial cost sharing rule for allocating the joint cost among a group of agents demanding a single homogeneous good. This serial rule combines the Moulin-Shenker's rule with its dual and allows it to depend on the variable returns of the cost function. This rule protects the larger demand agents when the production has increasing returns, i.e., when the cost functions are concave. On the other hand, when the technology exhibits decreasing returns to scale, i.e., the cost function becomes convex, it becomes the serial rule, which protects smaller demands. A single formula can combine the serial and the dual serial into a single rule. The proposed dual serial rule can be applied to a transmission capacity constrained electric power grid, to restore correct incentive in network expansion.

Fixed Benefit Games 31–44
V. Fragnelli, M.E. Marina

Abstract

We consider a problem in which a set of agents set up a joint venture, paying a cost and receiving a benefit. In our situation the cost depends on the agents involved, while the benefit is fixed.

Many well-known economic situations and problems fit this model: we can mention minimum cost connection, production, bankruptcy and co-insurance.

We want to investigate how the agents may share the benefit, taking into account their charges of the costs, so we analyze the behavior of some classical solution concepts and properties when the value of the benefit varies.

Resource Extraction Activity: an Intergenerational Approach 45–56
L. Grilli

Abstract

In this paper we study a differential game, for resource extraction of a renewable good, in which players are overlapping generations of extractors. The framework of overlapping generations allows us to consider intragenerational (players in the same generation) and intergenerational (players in different generations) game equilibrium. We consider the case in which old extractors face lower costs than young competitors and this will result in an advantage in strategies for old generation which compensate partially the reduced marginal resource rent. Since we consider overlapping generations, players have asynchronous horizons, in contrast with a number of studies in intertemporal exploitation of resources in which players have identical time horizons. We obtain the values function and strategies for extractors both for young generation and for old generations.

Information Protocols and Extensive Games in Inductive Game Theory 57–84
M. Kaneko, J. J. Kline

Abstract

We introduce a new mathematical representation of an extensive game situation, called an *information protocol*, without using the hypothetical underlying structure of nodes and branches. Its necessity has been emerging in our study of inductive game theory. It has two main differences from a standard extensive game: one is the use of information pieces (symbolic expressions) rather than information sets, and the other is the replacement of a game tree by a causal relation. We will give a set of axioms to show that our new formulation is equivalent to an extensive game. Also, by deleting some axioms, we can capture some weaker forms of extensive games, which are crucial to describing inductive game theory. Some theoretical results for inductive game theory become drastically simplified in the present formulation relative to previous formulations by the authors relying on extensive games.

Uncertainty Aversion and a Theory of Incomplete Contract 85–104
C. Ma

Abstract

This paper is to provide a theoretical foundation of incomplete contract in an extensive game of multi-agent interaction. It aims to explain why rational agents may agree upon incomplete contracts even though it is costless to sign a complete one. It is argued that an incomplete contract creates strategic uncertainty. If agents' attitudes toward uncertainty are not neutral, then an incomplete contract as final solution can be the consequence of common knowledge of rationality. This paper assumes that all agents are uncertainty averse in a sense of Gilboa and Schmeidler (1989); and that agents can form coalitions as part of strategic play. All these are embedded into a newly proposed equilibrium solution concept for extensive form game of perfect information.

Bioresource Management Problem with Changing Area for Fishery 105–114
V.V. Mazalov, A.N. Rettieva

Abstract

A dynamic game model related to bioresource management problem (fish catching) is considered. The center (state), which determines a share of prohibited for catching (reserved) area of a reservoir, and the player (fishing firm), which harvests the fish stock, are the participants of the game. The paper continues the series of authors' papers where the approach of optimal harvesting with changing area for fishing was developed. The model allowing a migratory exchanges between the two parts of the reservoir is considered. Steady state solutions and Nash equilibria are determined for finite and infinite planning horizons.

Associated Consistency Based on Utility Functions of Coalitions ... 115–126
N.I. Naumova

Abstract

A cooperative game problem is treated as a bargaining problem with claim point. For given continuous strictly increasing utility functions of coalitions, we suppose that for every partition of the player set, equal sacrifice w.r.t. these functions overestimation of characteristic function values for partition members does not change the result. This supposition and continuity assumption lead to a special value and give an iterative method for computation its results. In particular, for equal logarithmic utility functions of coalitions, we get proportional overestimation of characteristic functions for partition members and the value is the weighted entropy solution. The anonymity assumption and the "dummy" property give the Shapley value. The weighted entropy solution follows from the positive homogeneity assumption.

On the Not-Preference-Based Hoede-Bakker Index 127–142
A. Rusinowska

Abstract

The paper concerns a certain modification of the generalized Hoede-Bakker index - a notion defined for a social network of players. In the original Hoede-Bakker set up, preferences of players are involved. It is assumed that a player has an inclination either to accept or to reject a proposal, but due to the influence of others, his final decision may be different from his original inclination. In this paper, we propose the not-preference-based (NPB) generalized Hoede-Bakker index, where feasible strategies instead of players' inclinations are considered. We show that if all feasible strategy profiles are equally probable, then the NPB generalized Hoede-Bakker index is a 'net' Success, i.e., 'Success - Failure', where Success and Failure of a player is defined as the probability that the player is successful and fails, respectively. Moreover, under the assumption of equal probabilities of all feasible strategy profiles, we show that the probability that a player is lucky (Luck) equals the probability that he fails (Failure). Since Success - Luck = Decisiveness, it follows that, under the same assumption, the NPB generalized Hoede-Bakker index is equal to the probability that a player is decisive.

The Differential Game with "a Survival Zone" with Different Classes of Admissible Control Functions 143–150
B.T. Samatov

Abstract

The paper is devoted to the R. Isaacs game with "a survival zone", when admissible control functions of Pursuers team belong to L_2 and admissible control functions of the Evader belong to L_∞ . Dynamics of attainability domain of players are investigated. It is shown that on the plane they are inner of Gartesians oval or loop of Pascals snail.

An Overall-coalitional Marginalistic Value for Set Games 151–164
H. Sun, G. Xu and T. Driessen

Abstract

A new value by allocating, to any player, the items (taken from a universe) that are attainable for the player, but cannot be blocked (by any coalition not containing the player), is introduced in this paper. The resulting value for set games turns out to be main tool in order to characterize the family of set game solutions that possess a so-called potential representation. An axiomatization of this value, called overall-coalitional marginalistic value, is given by three properties, namely a kind of efficiency property, the equal treatment property and a kind of monotonicity property.

Game-theoretic Study of Divisible Good Auctions 165–182
A.A. Vasin, P.A. Vasina

Abstract

This paper considers different supply function auctions in a market for a divisible good. We study problems of existence, uniqueness and computation of Nash equilibria for these models. We also obtain an estimate of the Nash equilibrium deviation from the Walrasian equilibrium for each variant. We consider the problem of the optimal auction organization from the point of view of the social welfare maximization. We apply our results to the electricity market in Russia.

Innovation Game with Large Entrants 183–202
Z. Wu

Abstract

Two game models, all named as *innovation game with large entrants,* are constructed to analyze the innovator's behavior facing the large piracy. The basic model mentioned first is based on the classical two stages complete information dynamic game, and the second is new formed by this paper, which is considering the number uncertainty of entrants, and is called *game with entrant uncertainty* in this paper. The main result is that, in both of the two models, the innovation can always be the

equilibrium in the monopoly conditions, if the aggregate marginal effect of the indirect influence from the initial investment to the innovator's profit is strictly positive, then the large entrants will not influence the monopolist's innovation under certain assumptions, both in the classical model and the new one. Two simple models with linear payoff functions are considered specially, and we have got that the welfare will be better off in the case without patent system than the case with one, and the Innovation Equilibrium will always exist if the innovator's production is non negative, which can be fulfilled by implementing some monetary transfers.

A Solution Defined by Fine Vectors 203–214
G. Xu, H. Sun, C. Hoede and T. Driessen

Abstract

Bumb and Hoede have shown that a cooperative game can be split into two games, *the reward game* and *the fine game*, by considering the sign of quantities c_S^v in the c-diagram of the game. One can then define a solution x for the original game as $x = x_r - x_f$, where x_r is a solution for the reward game and x_f is a solution for the fine game. Due to the distinction of cooperation rewards and fines, for allocating the fines one may use another solution concept than for the rewards.

In this paper, a fine vector is introduced and a solution is defined by fine vectors. The structure and properties of this solution are studied. And the solution is characterized as the unique solution satisfying efficiency and $f-$potential property (resp. $f-$balanced contributions property).

On the Stability of Oligopoly Model with a Cournot Fringe 215–224
L. Zu, J. Zhang and H. Wang

Abstract

In this paper, we study the size of the stable cartel by using a model which is a symmetric oligopoly with Cournot fringe in which an industry's cartel acts as a Stackelberg quantity leader and the fringe firms, behaving strategically rather than as price takers, play the Cournot game after observing the quantity level set by the leader. It probes into the relationship between profitability and stability. It also examines how the size of the industry affects the size of a stable cartel. Existing literatures on cartel stability have been huge. Konishi & Lin's (1999) considered the existence and of stable cartels, found that there are always non-empty stable cartels with the general demand and cost functions based on the arguments of McManus (1964) and D'Aspremont et al. (1983). They also employed simulation to confirm their conjecture on what the size of stable cartel is, unfortunately, they were not able to prove it formally due to algebraic complexity. The main contribution of our paper is that it develops an analytical approach to show the size of the stable cartel for an industry which has a finite number of firms. Moreover, it reveals that Konishi & Lin's (1999) conjecture, which is based on the results of simulation, is incomplete.